Effect of Canola Oil Supplementation on Nutrient Digestion and Milk Composition

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Milk enriched in unstaurated fatty acids (FA), such as oleic acid (*cis*-18 : 1*n*-9) and conjugated linoleic acid (*cis*-9 *trans*-11 18 : 2, CLA) will have direct health benefits for humans. Achieving the desired levels of CLA in milk require the feeding of relatively high levels of canola oil which potentially could impact digestion and absorption of nutrients. Additionally, we simulated the feeding of a "protected" lipid supplement by using postruminal infusion of canola oil. Five ruminally and duodenally cannulated late-lactation Holstein cows were used in a 3 x 5 incomplete latin square design. The treatments were 1) Control: basal diet (CON), 2) Control + supplementation of canola oil at 1 kg/d in the feed (FED), and 3) Control + abomasal infusion of 1 kg/d of canola oil (INF).

Feed intake, ruminal fermentation characteristics and, ruminal and total tract digestibilities of nutrients were not significantly affected with FED compared to CON. Incomplete biohydrogenation of C_{18} unsaturated FA with FED resulted in increased duodenal flows of *trans*-11 18 : 1 and CLA. These FA were increased nearly 2-fold in milk from FED compared to CON or INF cows. In contrast to the effects of FED, INF resulted in reductions in feed intake, total VFA production, intestinal flows of nutrients, FA digestibility and, milk and milk fat yields. Both FED and INF resulted in significant reductions in the proportions of saturated and medium chain fatty acids, and increased *cis* 18 : 1 in milk. The concentrations of 18 : 2*n*-6 and 18 : *3n*-3 in milk were increased nearly 2-fold with INF relative to CON. Canola oil supplementation reduced saturated FA and increased unsaturated C_{18} FA in milk, however, nutrient digestion was adversely affected with abomasal infusion of canola oil.

Implications: Feeding large amounts of canola oil (1kg/d) had negligible impact on nutrient digestion but increased the proportion of oleic acid and CLA at the expense of saturated FA in milk. Such a FA profile in milk may have favorable health implications for humans.